Power System

- TIGER Mission Power Requirements
  - Experiment: 200 watts continuous, 400 watts for 6 hours (night)
  - CDM: 200 watts continuous
  - Daytime load requirements: 4800 watthours
  - Nighttime load requirements: 7200 watthours
  - Total load requirements: 12,000 watthours
- **Solar Array** requirements
  - Based on 12 hour solar day cycle, with 4 hour @ 30% balloon masking
  - **1200 watt solar panels required**
  - 13,000 watthour power generated
- **Battery** storage requirements
  - 7200 watt @ 28vdc = 257 ah
  - 340amp/hours available @ 80% depth-of-discharge = 272amp/hours

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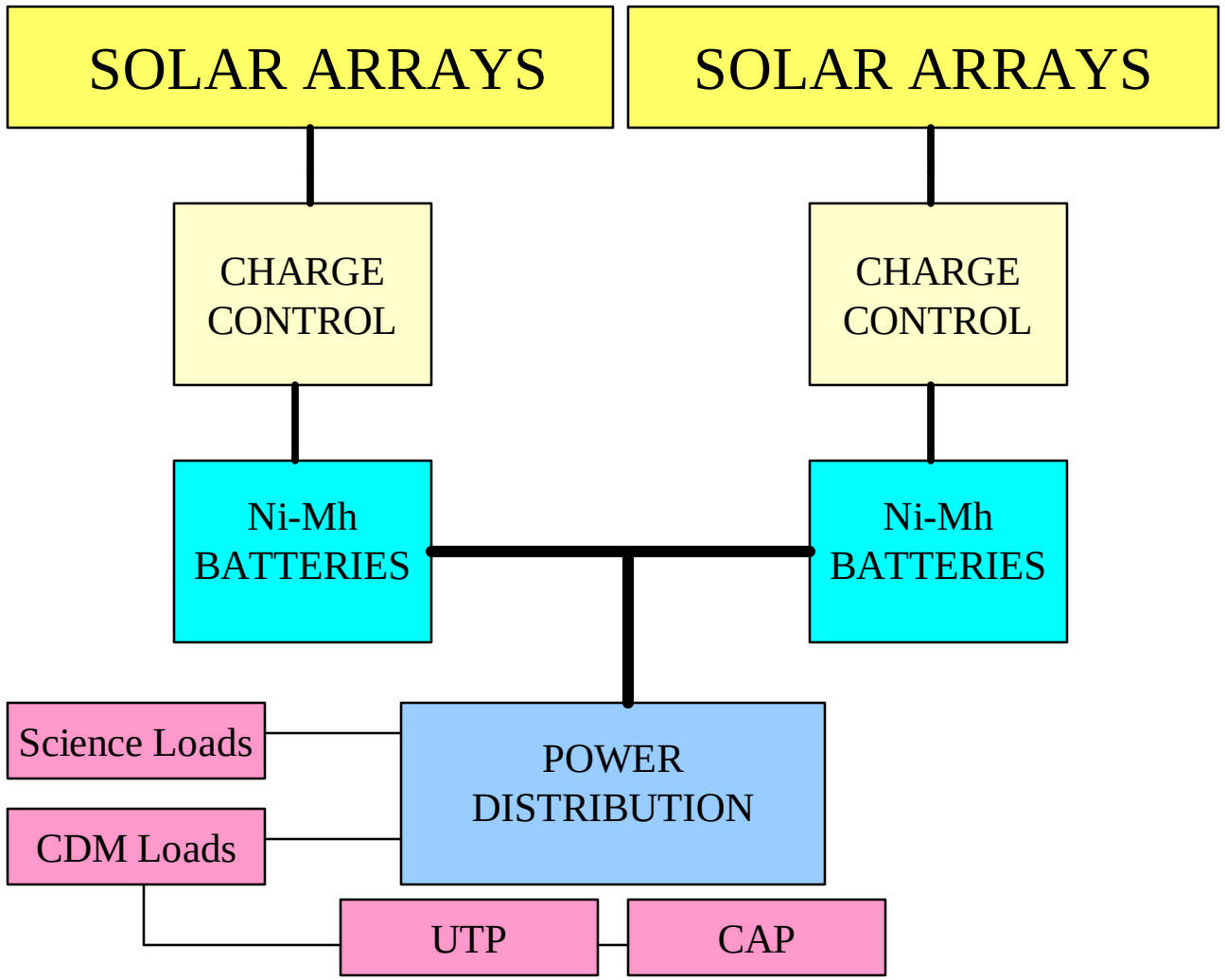
October 14-15, 1998

Power System



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Power System

- Solar Power Generation

  - Amourphous silicon thin film
  - 1200 watt solar arrays
  - 60 watts per sq.meter - 20 square meters required
  - Balloon masking considered
  - 54 watts per kg - 22 kg plus deployment mechanism
  - Thermally cycled: -90 to +90 deg.C.

  - In case of Rotator failure:
    - Back-up 300 watt omni-directional arrays

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Power System

- Battery Charge Controllers
  - Require one for each 2-battery pack
  - 40 amp capability (<10 amp required)
  - Employs battery temperature compensation circuitry
  - Low/High voltage protection circuitry
  - Designed specifically for PV systems
  - Operating range: -40 to +40 deg.C.

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Power System

- Battery Storage System
  - Nickel Metal Hydride Battery
  - Total 8 batteries at 18kg each - 144kg (320 lbs.)
  - 340 amp-hours storage - 85 ah per 2 battery pack
  - .267 cu.ft each - total 2.14 cu.ft.
  - Operating range: 0 to 40 deg.C.
  - Tested to 250,000 ft.
  - Temperature controlled battery boxes (heaters)

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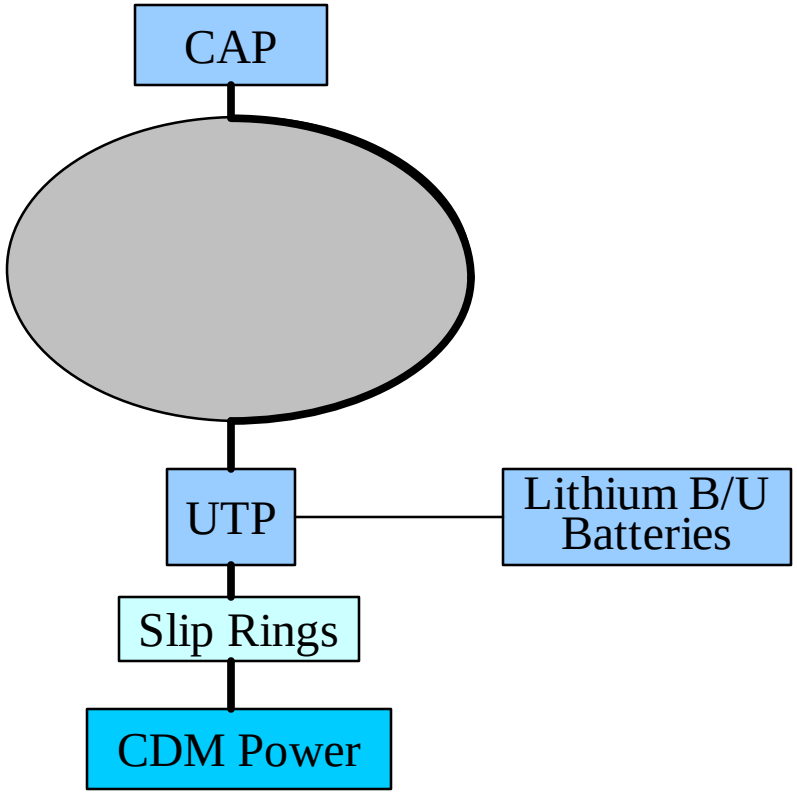
Power System

- UTP - CAP Power
  - Provided by CDM power system



- Lithium primary batteries
  - Provide B/U power to items required for recovery.

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Power System

- Trade Studies
  - Solar Arrays - Type
    - Amorphous-silicon thin film
      - Lighter / voltage regulation / higher efficiency, price
    - Mono-crystalline silicon
    - Integrated High-Concentration Photovoltaic
  - Solar Arrays - Sizing
    - Azimuth Pointing - Fixed Elevation
      - Size / reliability / weight
    - Omni - Directional
    - Azimuth Pointing - Elevation Pointing

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Power System

- Trade Studies
  - Batteries
    - Ni-Mh,
      - Cost / Size / Weight
    - Silver - Zinc
  - Charge Controllers
    - COTS
      - Cost / Performance
    - Custom Build

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Power System

RISK ASSESSMENT & MITIGATION

- BALLOON PROGRAM - NEW ITEMS - COTS
  - Solar Arrays
  - Ni-Mh Batteries
  - Charge Controllers

- Manufacturer's Specs meet requirements for application

AND / OR

- Systems are being tested to prove applications
- Redundancy built into all systems
- Systems will be flight tested prior to actual use

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